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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/540,834

06/23/2005

Hiroyuki Sato

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2146

23570

7590

05/12/2009

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EXAMINER

TISCHLER, FRANCES

ART UNIT

PAPER NUMBER

1796

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/540,834	<b>Applicant(s)</b> SATO ET AL.	
	<b>Examiner</b> FRANCES TISCHLER	<b>Art Unit</b> 1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 February 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3,4,6,7,10,13-16,18 and 19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3,4,6,7,10,13-16,18 and 19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                       | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>2/24/09</u> .   | 6) <input type="checkbox"/> Other: _____                          |

### DETAILED ACTION

The IDS, 35 USC 112 and 35 USC 103 rejections not discussed below are deemed withdrawn.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

#### ***Claim Rejections - 35 USC § 103***

**Claims 1, 3, 4, 10, 14, 15 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasaki (US 4,769,442) in view of Water Encyclopedia, pages 350 – 352.**

Iwasaki discloses (2:4 – 59, 4:1 – 27, 5:4 - 42) a process for producing a polyarylene sulfide (PAS) comprising:

- reacting an alkali sulfide and a di-chloroaromatic compound/di-halo aromatic compound in N-methylpyrrolidone(NMP)/aromatic amide solvent,
- separating the polymer slurry from the solution using a sieve,
- washing the separated PAS polymer with an organic solvent, preferably acetone,
- recovering the organic solvent,
- using the organic solvent repeatedly by first recovering it by distillation and by passing it through a column and then purified, part or all of which can then be used on the polymer slurry in the separation step.

Applicant claims adding alkali metal hydroxide as needed. This is needed when metal hydrosulfides are used. Since Iwasaki discloses the use of alkali sulfide, there is no need to add the alkali metal hydroxide. Typically, alkali sulfide is made in situ using metal hydrosulfide and alkali metal hydroxide, both of which would inherently be present in Iwasaki's invention in order to obtain the disclosed alkali sulfide. The process of distilling the solvent and the process of passing the solvent through a column to purify it read on applicant's claim of purifying the solvent recovered.

Iwasaki discloses (2:2 – 35) that the polymer slurry is sifted while being washed with the organic solvent. The sieve acts to separate the polymer from the solution (NMP, acetone, and other soluble by-products).

Iwasaki discloses (3:35 – 59) a two stage polymerization process comprising reacting the dihaloaromatic compound in a conversion of 50 – 98 mole% with alkali sulfide in a solvent consisting of 0.2 – 5 liters of NMP and 0.5 – 2.4 moles of water per mole of sulfide at a temperature of 180 – 235°C, then adding water to amounts of 2.5 – 7 moles per mole of sulfide at temperatures of 245 – 290°C.

Iwasaki discloses (4:23 – 27) recycling the used acetone after distillation, which means the acetone is being purified. Iwasaki also discloses (5:38 – 42) purifying the acetone by passing it through a column and then purified, but is silent on activated carbon comprising the column. Passing solutions over activated carbon for removal of organic impurities is well known in the art, as disclosed by the **Water Encyclopedia on pages 350 – 352**. The water Encyclopedia discloses the use of a column with activated

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carbon to remove organic impurities such as herbicides or pesticides (dimethylamine, for example, is a herbicide). Therefore, it would have been obvious to one of ordinary skill in the art to have used activated carbon on Iwasaki's column since organic by-products are expected to be eliminated from the solvent in order to purify the latter.

Iwasaki is silent on the amount of alkaline compound/methylamine left in the purified acetone and on the yellow index of the polymer; however the amount of methylamine would inherently be lowered by the process of purification through a column and distillation, and the yellow index would inherently be the same as claimed, since Iwasaki's polymer, process of making it and its washing treatment are substantially identical to the claimed invention. Alternatively, it would have been obvious to one of ordinary skill in the art to have varied the column parameters and the washing parameters as necessary through routine optimization to obtain the lowest amount of methylamine left and to obtain the optimal yellow index value.

**Claims 1, 3, 4, 6, 7, 10, 13, 15, 16, 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyahara (WO/03/048231, using the English translation of US2005/0087215).**

**Miyahara** discloses a process of polymerizing polyarylene sulfide from an alkali sulfide or alkali hydrosulfide with alkali hydroxide, an aromatic dihalide compound and a polar organic solvent, such as NMP ([0025], [0027], [0031]).

The reactants are first dehydrated by heating to control the water content in the mixture ([0063]).

The polymer is separated from the liquid through sieving ([0015]). Washing of the polymer is done by successive methods which include washing with acetone ([0044]), recovering the acetone through distillation ([0045], [0046], [0054], [0060]). The washing is also treated with an acid, specifically HCl, added to the solvent ([0047], [0048], [0051] – [0054]). Specifically: “ a washing waste fluid comprising water, acid and acetone is discharged out of the port B.... and the washing waste fluid can be easily separated by distillation so as to recover acetone”.

The acid treatment is effective for increasing the crystallization temperature and speed ([0047]).

Miyahara is silent as to the exact crystallization temperature, the yellow index, and the amount of alkaline by-product/methylamine left in the solvent. However, since Miyahara's PAS polymer, the process of making it and its washing treatment are substantially identical to the instant application, Miyahara's yellow index, crystallization temperature and amount left of methylamine would inherently be the same as in the instant application. Alternatively, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have varied the amount or strength of the acid or the number and strength of washes, as necessary through routine optimization to obtain the desired results.

**Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyahara (WO/03/048231, using the English translation of US2005/0087215) in view of Iwasaki (US 4,769,442).**

**Miyahara** discloses ([0063]) a two stage polymerization process but does not teach said steps in terms of the specific mole ratios between sulfur and water as claimed by Applicant. However, it would have been obvious to one of ordinary skill in the art to have used Iwasaki's two stage polymerization process in Miyahara's disclosure for the same purpose of polymerizing PAS to obtain the same results since both disclose the use of the same reactants to obtain the same product and to wash said product in similar manner.

**Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasaki (US 4,769,442) in view of Miyahara (WO/03/048231, using the English translation of US2005/0087215).**

**Iwasaki** is silent on a step of heating and dehydrating the mixture prior to polymerization. Miyahara discloses such process in order to control the water content. It would have been obvious to one of ordinary skill in the art to dehydrate Iwasaki's mixture as disclosed by Miyahara since both are disclosing the same reaction and process to obtain the same results.

**Claims 1, 3, 4, 6, 7, 10, 13 – 16, 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyahara (WO/03/048231, relying on the English translation of US2005/0087215) in view of Iwasaki (US 4,769,442) and further in view of Water Encyclopedia, pages 350 – 352, or vice versa.**

Applicant claims in independent claim 1 a washing step of either using an inorganic acid/HCl or activated carbon. Miyahara discloses the addition of HCl in the washing step but is silent on activated carbon. Iwasaki discloses the use of a column which is known to be made of activated carbon, as taught by Water Encyclopedia, but is silent on the use of HCl. However, it would have been obvious to one of ordinary skill in the art to have used Iwasaki's column/activated carbon in Miyahara's disclosure and it would have been obvious to one of ordinary skill in the art to have used Miyahara's HCl in Iwasaki's disclosure for the same purpose of washing the polymer and separating impurities from the organic solvent/acetone so that said solvent can be reused.

### ***Response to Arguments***

Applicant's arguments filed 2/24/09 have been fully considered but they are not persuasive.

Applicant submits that Iwasaki does not disclose the use of HCl, that the simple distillation taught does not remove methylamine and that Iwasaki does not recognize that methylamine is a harmful by-product for the polymer because it gives it a yellow color.

Iwasaki does not teach the use of HCL as per amended claim 1. However, Miyahara teaches such use. Claim 1 claims either HCl or activated carbon. Iwasaki passes the polymer and organic solvent/acetone through a column to be purified. Columns are known to be used with activated carbon when organic contaminants are present, as disclosed by Water Encyclopedia. Since Iwasaki discloses the same



polymer and the same method of cleaning the polymer and the solvent with a column/activated carbon, any methylamine present will be removed by the same amount as claimed by Applicant, even if Iwasaki does not recognize or is silent about said by-product. The column parameters can also be optimized to produce purified acetone to be reused on the polymer to give said polymer the desired yellow index through routine experimentation.

Applicant submits that Miyahara '215 does not teach that any organic solvent from the acid solution is recycled for further use, and that Miyahara '215 does not recognize that methylamine is a harmful by-product for the polymer because it gives it a yellow color.

Examiner respectfully disagrees. In the fifth embodiment, for example, Miyahara discloses that "a washing fluid comprising water, acid and acetone are discharged..., separated by distillation so as to recover the acetone". Since the acetone is recovered, it implies that it is reused. The fact that Miyahara does not recognize or is silent about the methylamine by-product does not detract from the fact that Miyahara's polymer, process, solvent, HCl, etc. are the same as claimed, and therefore the process will inherently remove that same amount of methylamine and give the same color index to the polymer. The HCl concentration, amount of cleaning time, etc. can also be varied through routine experimentation to give the desired results.

Applicant submits that the references do not recognize that an alkaline compound such as methylamine is contained in the washing fluid and therefore would not have thought of using activated carbon in the column.

Examiner respectfully disagrees. Polymerization reactions of PAS, as well as most polymers, are well known in the art and the by-products of said reactions are also well known. Organic compounds are common by-products. The use of activated carbon in columns is also very well known in the art. It would have been obvious to have used a column with activated carbon to clean organic compounds from the solvent and/or polymer. Even if, arguendo, Iwasaki does not use activated carbon in the column, which he does, claim 1 claims the alternative of using HCl instead of activated carbon, which is clearly disclosed by Miyahara.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to FRANCES TISCHLER whose telephone number is (571)270-5458. The examiner can normally be reached on Monday-Friday 7:30AM - 5:00 PM; off every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jim Seidleck can be reached on 571-272-1078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ Irina S. Zemel/  
Primary Examiner, Art Unit 1796

Frances Tischler  
Examiner  
Art Unit 1796

/FT/

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